MAMMALOGY

Project title: The Effects of Environmental Variability on Grizzly Bear Habitat Use

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Objective: The overall design of this project is to utilize existing data, expertise and newly collected data from advanced technologies to evaluate the impact of anthropomorphic influences on grizzly bear *(Ursus arctos)* habitat selection. Initially, this study will have three areas of emphasis: 1) To evaluate potential relationships between habitat use and road density. 2) To evaluate potential relationships between habitat use intensity and types of human activity. 3) To evaluate potential relationships between habitat selection and land management status.

Findings: During the 2001 field season the Interagency Grizzly Bear Study Team and the Wyoming Game and Fish instrumented nine bears for this project. Of the nine grizzly bears collared, four were adult females, four were adult males and one was a sub-adult male. The first collar was deployed on May 7, 2001 and the last collar was deployed on July 9, 2001. These collars have a programmable duty cycle, which we programmed to attempt a location collection every 210 minutes. The collars will power down on November 15, 2001 and come back on April 15, 2002. The collars also have a remote release mechanism, which will automatically release the collar throughout the 2001 non-denning season. Collars will be collected and data downloaded by the researchers. Also during the 2001 field season we retrieved nine collars that were programmed to release during the 2001 non-denning season. Of these nine collars five were from males and four were from females. The retrieved GPS collars had a mean acquisition rate of 68% with a maximum acquisition rate of 78% and a minimum acquisition rate of 54%. The mean operational days of the retrieved collars was 260 days with a minimum operational days of 166 and a maximum number of operation days of 351. The mean number of successful locations was 1,063 with a minimum number of successful locations from one collar being 443 and the maximum number of successful locations from one collar being 1,618. In addition to GPS locations an attempt was made to locate and record locations of these bears using radio telemetry approximately every ten days.

In addition to the above activities we updated ancillary biophysical data sets, developed protocols for GPS data and began preliminary data analysis.

Next year the researchers plan to use this same collar technology and attempt to deploy 14 more collars.

In addition to the collection information on Grizzly Bears the researchers will continue preliminary

data analysis, test the affect of terrain on location acquisition success and update the current grizzly bear habitat coverages and other biophysical data layers with available data.

Project title: Population Dynamics of the Yellowstone Grizzly Bear

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Objective: To describe the population trend from threatened status to recovery and approximate stability.

Findings: These data include information collected by the Interagency Grizzly Bear Study Team (members include USGS-BRD, YNP, WYDGF, IDFG, MTDFWP, USFWS, USFS) for the entire Greater Yellowstone Ecosystem. Data obtained within YNP is not broken out separately. 63 individual grizzly bears were captured a total of 73 times during the 2001 field season in the Greater Yellowstone Ecosystem (GYE). 40 captures were new individuals that had not been previously marked. 32 captures of 28 bears were the result of management trapping efforts. 15 of these instances resulted in relocation of the nuisance bear(s). A total of 933 aerial radiolocations were obtained from 82 individual grizzly bears radio-monitored during all, or a portion of the 2001 field season. 31 of the grizzly bears radio-monitored were adult females. Two rounds of observation flights were conducted as part of our effort to count unduplicated females with cubs-of-the-year and document distribution of females with young (cubs, yearlings, or two-year-olds). The first round of flights began June 19. 79 grizzly bears were observed in 49 groups during 72 hours of flying. The second round of flights began on July 17. A total of 171 grizzly bears in 120 groups were observed during 72 hours of flying. 37 females with young were observed during observation flights; 20 of these were initial observations of unduplicated females with cubs-of-the-year. 42 unduplicated females with cubs were identified during 2001. A total of 78 cubs were observed during the initial sightings of unduplicated females. 13 single cub litters, 22 litters of twins, and 7 litters of triplets were observed. Mean litter size was 1.9. Unduplicated females with cubs were observed in 14 of 18 Bear Management Units (BMU) within the grizzly bear recovery zone. Females with young (cubs, yearlings or two-year-olds) were documented in all 18 BMUs. We documented 20 known and one probable human-caused grizzly bear mortalities in the GYE during 2001. 19 human-caused mortalities, including six adult females and eight total females, occurred within the USFWS Recovery Zone and ten-mile perimeter. 16 losses were from management removals, including four bears that were initially translocated, but became involved in subsequent conflicts and were removed. 13 and three management removals occurred in Wyoming and Montana, respectively. Five natural (four known and one probable) mortalities were documented. Six grizzly bears that died from unknown causes were documented during 2001.

Project title: Development of Aerial Survey Methodology for Bison Population Estimation in Yellowstone National Park

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Objective: The overall objective of this study is the development of aerial survey methodology for statistically rigorous estimation of the bison population in the Yellowstone area that will have sufficient power and precision to detect demographic trends. This methodology will allow NPS resource managers to conduct aerial surveys that provide scientifically defensible population estimates to address ecological conditions and epidemiological management issues of Yellowstone bison.

Findings: We developed survey protocols, data recording procedures, a geographic framework, and seasonal stratifications based on our aerial surveys of bison in Yellowstone from February 1998 until September 2000. We examined the reliability of the framework and strata using long-term data from 1970–1997 for both summer and winter. We used simulations to evaluate different sample survey designs and compared them to single and multiple high-effort censuses of well-defined areas traditionally occupied by bison. We found that sample survey designs require extensive information on the current spatial distribution of bison and therefore do not offer any substantial reduction in time and effort over high-effort censuses. They may also provide biased or imprecise estimates when bison are highly aggregated in summer. We used concurrent intensive ground surveys, or "double sampling", in the Madison-Gibbon-Firehole areas and the Northern Range in winter, and Hayden Valley in summer to estimate the magnitude and variability in detection probability during aerial surveys. We calculated Lincoln-Peterson estimates of detection probability for groups of bison, and also developed a logistic regression model for detection probability that accounts for group size distribution and habitat. In winter, we found that 74.8% of the groups were detected on average from aircraft, although 91.9% of individual bison were detected, while in summer, 79.1% of groups and 96.7% of individual bison were detected. We also used photography to quantify the bias due to counting large groups of bison accurately. We found that undercounting increases with group size and can reach 15%. We compared survey conditions between seasons and identified optimal time windows for conducting surveys in both winter and summer. These windows account for the total area bison occupy, their group size distribution, and the habitats they occur in. Bison become increasingly scattered over the Yellowstone region in smaller groups and occupy habitats that are unfavorable as winter progresses. Therefore, the best conditions for winter surveys occur early in the season. In summer, bison are most spatially aggregated and occur in very large groups, primarily in open habitats in Hayden Valley, Lamar Valley, and on the Mirror Plateau in late July and early August. Our results show that low variability between surveys and high detection probability provide population estimates with an overall coefficient of variation of roughly 8% and have high power for detecting trends in population change. We demonstrated how population estimates from winter and summer can be integrated into a comprehensive monitoring

program to estimate annual growth rates, overall winter mortality, an index of calf production and how to relate these vital rates to climate and density. In September 2000, we completed field research and presented preliminary results at a national conference of The Wildlife Society in Nashville, Tennessee. We have completed a draft final report and circulated this document on January 3, 2002 for comments.

Project title: Black Bear Demographics in Yellowstone National Park: Their Interrelationship to Other Carnivores, Habitats, and Humans

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Additional investigators: Mark Haroldson, Kerry Gunther, Glenn Plumb

Objective: To determine patterns of habitat use, food habits, activity patterns, movements, and home range size for a sample of randomly captured black bears.

Findings: No additional black bears were captured during the 2001 field season. One Global Positioning System collar released as scheduled during 2001 and was retrieved. This collar contained 959 locations and had been worn by an adult female black bear. Attempts will be made to handle the remaining two black bears wearing GPS collars that did not release in dens during the winter of 2002.

Project title: Food Habits and Habitat Use of the Yellowstone Grizzly Bear

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Objective: To determine habitat requirements for the Yellowstone grizzly bear and to document its return to free-ranging status.

Findings: Surveys to determine an index of spring ungulate carcass availability were conducted during May. Approximately 300 km of transect routes were surveyed in four different ungulate wintering areas. A total of 25 elk, 4 bison, 2 mule deer, and 1 pronghorn carcasses were observed for a rate of 0.11 ungulate carcasses/km. These results indicate a relatively small number of winterkilled ungulates were available to bears during the spring of 2001. Surveys of spawning cutthroat trout and their use by grizzly bears on tributary streams to Yellowstone Lake were completed in 2000. Results indicate no change in peak numbers of spawning cutthroat trout between early and recent survey periods on most tributary streams. Exceptions were West Thumb area streams where peak and duration of spawning trout had declined. Grizzly bear hair samples suitable for DNA analysis were collected near spawning streams during 1997–2000. Final results found a minimum of 75 individual grizzly bears visited spawning stream areas during the course of the study. Surveys of 19 whitebark pine cone productivity transects distributed throughout the GYE were completed during July. Mean cones per tree for the read transects were 25.5. Transects in the northern part of the ecosystem typically had higher cone production than those in the southern and eastern portions. Surveys of whitebark pine pathogens on the 19 transects were completed in 2001. Eleven transects showed definitive evidence of infection with white pine blister rust. A total of 143 grizzly bear observations, including 29 family groups, were recorded at 16 of the aggregation sites identified through 2000. Grizzly bears were observed digging in talus, presumably for moths, at an additional, previously unknown site during 2001.